

LRI Children's Hospital

Complex acute pain and complex oncology care of Children and Young People requiring Morphine/Fentanyl patient controlled analgesia, Nurse controlled analgesia & continuous Ketamine and Clonidine infusion.

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|---------------------|---|
| Staff relevant to: | Health Professionals who care for children & young people with Morphine/Fentanyl Patient Controlled Analgesia, Nurse Controlled Analgesia & Continuous Ketamine and Clonidine Infusion. |
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| Written by: | Zoe Syrett |
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1. Introduction and Who Guideline applies to:

To provide Health Professionals guidance in the safe and effective care and management of a child or young person receiving Morphine/Fentanyl Patient Controlled Analgesia (PCA), Nurse Controlled Analgesia (NCA) and Continuous Ketamine and Clonidine Infusion. This guidance is to be used for complex oncology and complex

acute pain in children aged under 18 years only. For non-complex, non-oncology children and for adult patients please refer to –

- [Patient Controlled Analgesia \(IV PCA\) to Adults and Children over 16 in an Adult Environment UHL Policy](#)
- [Patient \(PCA\) and Nurse Controlled Analgesia \(NCA\) and Continuous Morphine Infusion UHL Childrens Hospital Guideline](#)

This guideline should be used in conjunction with the;

- [Consent to Examination or Treatment UHL Policy](#)
- [IV \(Intravenous Therapy\) UHL Policy](#)
- [Vascular Access UHL Policy](#)
- [Controlled Drugs UHL Policy](#)
- [Leicestershire Medicine Code UHL Policy](#)
- [Aseptic Non Touch Technique UHL Guideline](#)

2. Procedure

| 2. Resources/Procedure | |
|------------------------|---|
| No. | Action |
| a) | <p>Identify the suitability of the child/young person for the use of PCA ensuring that:</p> <ul style="list-style-type: none"> • The child or young person has appropriate mental capacity to be able to understand how to use the PCA • Physically able to push the button on the pump handset • Understands the relationship between pressing the PCA button and |

| 2. Resources/Procedure | |
|------------------------|---|
| | receiving the analgesia |
| b) | You must ensure that the parent/carers and child/young person are given a full explanation of what a PCA/NCA/ketamine/clonidine infusion is, answer any questions and ensure that an information leaflet on PCA/NCA/ketamine/clonidine infusion is available and given to the parent/carers and/or child/young person at the time of consent of treatment |
| c) | You must ensure that the prescription adheres to the Leicestershire Medicines Code prescribing standards and is prescribed correctly on eMeds |
| d) | You must ensure that additional analgesia is prescribed regularly; but no other opiates (except in exceptional circumstances under direction from the pain team/Ward 27 Consultant Oncologist*) Caution must be used for NSAIDS in oncology/nephrology patients. |
| e) | You must reassure the child/young person, parent/carer that if they are not happy using the PCA device at any time it can be discontinued and alternative analgesia will be used |
| f) | You must explain that only the child/young person should press the PCA device For NCA nursing/medical staff to administer bolus via NCA button – A sleeping or sedated child should NEVER be given a bolus of IV opioid |
| g) | You must contact the Paediatric Pharmacist before administering any other drug via the same line as the PCA/NCA to ensure safe compatibility |
| h) | * If this guidance is used outside ward 27 on a non-oncology patient anaesthetics will manage the patient and the on call team out of hours will be anaesthetic registrar on call |

Commencing Intravenous Analgesia

If pain is not controlled with oral analgesia or if the oral route is not available

1. Commence morphine PCA/NCA. Administer a loading dose of up to 5ml of PCA/NCA solution to bring pain under control prior to commencing the PCA/NCA infusion.
2. If IV route not available intranasal fentanyl can be considered until IV access/infusion set up (refer to PED IN fentanyl guideline via insite). Infusion can be commenced 30-45 after administration.
3. If the child/young person has had a previous poor response to morphine, commence a Fentanyl PCA/NCA.

CAUTION; IV Fentanyl MUST NOT be given as a loading dose

Prior to NEXT STEP – Contact ward 27 oncology consultant*, pain team and pharmacist

4. **If pain is poorly controlled on morphine PCA/NCA alone, consider changing to a Fentanyl PCA/NCA. Ensure that PCA/NCA facility has been fully optimised prior to next step.**
5. **If pain is poorly controlled on Fentanyl PCA/NCA alone, consider adding a ketamine infusion at 0.5ml/hr. Increase the rate by 0.5ml/hr every 6 hours if pain is not controlled, to a maximum rate of 2mls/hr. (See below). Ensure that PCA/NCA facility has been fully optimised prior to next step.**
6. **If pain is poorly controlled on Fentanyl PCA/NCA and Ketamine, consider adding a clonidine infusion at 0.5ml/hr. (See below) *Please see NB in section 2.5 prior to commencing clonidine as 3rd line infusion***
7. **Start backgrounds/infusions at lower rate and gradually increase as required.**
8. The pain team can be contacted during normal working hrs on 07908454867 for advice or referrals. Out of hours service is covered by the ward 27 on-call consultant Oncologist*
9. *** If this guidance is used outside ward 27 on a non-oncology patient anaesthetics will manage the patient and the on call team out of hours will be anaesthetic registrar on call**

Prescribing protocols for opioid PCA/NCA for children 13 weeks and older
Ketamine and Clonidine for children over 1 year
Babies under 13 weeks – refer to consultant

| Protocols | | | | | | | |
|-------------------------|--------|-----------------|----------------------|--------------|----------------------------|--------------------------|--|
| Drug | Weight | Dose | Diluent | Final Volume | Loading Dose | Programme | |
| Morphine Sulphate | <50kg | 1mg/kg | 0.9% sodium chloride | 50 ml | up to 5 ml of PCA solution | Background Bolus Lockout | 0.2-1ml/hr 1ml 5 min PCA 15 min NCA |
| | >50kg | 50mg | | | | | |
| Fentanyl Citrate | <50kg | 50 microgram/kg | 0.9% sodium chloride | 50 ml | none | Background Bolus Lockout | 0.2-1ml/hr 1ml 15 min |
| | >50kg | 2500 microgram | neat | | | | |
| Ketamine Hydrochloride | <50kg | 5mg/kg | 0.9% sodium chloride | 50 ml | none | Rate Start at | 0.5-2ml/hr 0.5ml/hr |
| | >50kg | 250mg | | | | | |
| Clonidine Hydrochloride | <50kg | 50 microgram/kg | 0.9% sodium chloride | 50 ml | none | Rate Start at | 0.1-1ml/hr 0.5ml/hr |
| | >50kg | 2500 microgram | | | | | |

12/14/2020

2.1 SET UP PROTOCOL MORPHINE PCA:

Refer to Children's Hospital IV monograph for morphine (in medusa)

Morphine Sulphate **1mg/kg** made up to 50mls with 0.9% sodium chloride (this gives a concentration of 20 microgrammes/kg/ml) to a maximum concentration of 50mg in 50mls (1mg/ml)



Bolus dose is 1ml = (20 microgrammes/kg) of morphine



The minimum lock out time (the time between available doses of morphine) is **5 minutes** unless the initiating doctor decides a longer period is preferable.



If a continuous background infusion is required start at 0.2ml/hr and tritrate, if required, up to 1ml/hr, **this dose should not be exceeded**

- The syringe must be changed every 24hrs as per UHL Intravenous Medication Policy and ANTT Guideline with **two** registered nurses, one of whom must be IV assessed, must check and set up the new infusion.
- Ensure Naloxone prescribed at 4 micrograms per KG* (initial dose) for partial reversal, and repeat after 1 minute if required, to cumulative total dose not greater than 2mg, irrespective of body weight. If inadequate effect or complete reversal required, use 100 micrograms per KG dose instead, repeated as necessary, to cumulative total dose not greater than 2mg (see page 11)
- N.B Naloxone has a short acting life, close observation is essential as further doses may be required.

2.2 SET UP PROTOCOL MORPHINE NCA:

Refer to Children's Hospital IV monograph for morphine (in medusa)

Morphine Sulphate **1mg/kg** made up to 50mls with 0.9% sodium chloride (this gives a concentration of 20 microgrammes/kg/ml) to a maximum concentration of 50mg in 50mls (1mg/ml)



Bolus dose is 1ml = (20 microgrammes/kg) of morphine



The minimum lock out time (the time between available doses of morphine) is **15 minutes** unless the initiating doctor decides a longer period is preferable.



If a continuous background infusion is required start at 0.2ml/hr and tritrate, if required, up to 1ml/hr, **this dose should not be exceeded**

- The syringe must be changed every 24hrs as per UHL Intravenous Medication Policy and ANTT Guideline with **two** registered nurses, one of whom must be IV assessed, must check and set up the new infusion.
- Ensure Naloxone prescribed at 4 micrograms per KG* (initial dose) for partial reversal, and repeat after 1 minute if required, to cumulative total dose not greater than 2mg, irrespective of body weight. If inadequate effect or complete reversal required, use 100 micrograms per KG dose instead, repeated as necessary, to cumulative total dose not greater than 2mg (see page 11)
- N.B Naloxone has a short acting life, close observation is essential as further doses may be required.

2.3 SET UP PROTOCOL FENTANYL PCA/NCA:
Refer to Children's Hospital IV monograph for Fentanyl for pain (in Medusa)

Fentanyl Citrate **50 microgram/kg (max 2500 microgram)** made up to 50mls with 0.9% sodium chloride (this gives a concentration of 1 microgram/kg/ml)



Bolus dose is 1ml = 1 microgram/kg (max 50microgram) of Fentanyl



The minimum lock out time (the time between available doses of Fentanyl) is 15 minutes unless the initiating doctor decides a longer period is preferable.



If a continuous background infusion is required start at 0.2ml/hr and tritrate, if required, up to 1ml/hr, **this dose should not be exceeded**

- The syringe must be changed every 24hrs as per UHL Intravenous Medication Policy and ANTT Guideline with **two** registered nurses, one of whom must be IV assessed, must check and set up the new infusion.
- Ensure Naloxone prescribed at 4 micrograms per KG* (initial dose) for partial reversal, and repeat after 1 minute if required, to cumulative total dose not greater than 2mg, irrespective of body weight. If inadequate effect or complete reversal required, use 100 micrograms per KG dose instead, repeated as necessary, to cumulative total dose not greater than 2mg (see page 11)
- N.B Naloxone has a short acting life, close observation is essential as further doses may be required.

2.4 SET UP PROTOCOL KETAMINE INFUSION:
Refer to Children's Hospital IV monograph for Ketamine for pain (in Medusa)

Ketamine Hydrochloride **5 mg/kg** made up to 50mls with 0.9% sodium chloride to a maximum concentration of 250mg in 50mls (5mg/ml)



Start at 0.5 ml/hr to maximum rate 2ml/hr
This dose should not be exceeded

- The syringe must be changed every 24hrs as per UHL Intravenous Medication Policy and ANTT Guideline with **two** registered nurses, one of whom must be IV assessed, must check and set up the new infusion

2.5 SET UP PROTOCOL CLONIDINE HYDROCHLORIDE INFUSION:
Refer to Children's Hospital IV monograph for Clonidine for pain (in Medusa)

Clonidine Hydrochloride **50 micrograms/kg** made up to 50mls with 0.9% sodium chloride to a maximum concentration of 2500micrograms in 50mls (50 micrograms/ml)



Start at 0.5 ml/hr up to maximum rate 1ml/hr **This dose should not be exceeded**

- The syringe must be changed every 24hrs as per UHL Intravenous Medication Policy and ANTT Guideline with **two** registered nurses, one of whom must be IV assessed, must check and set up the new infusion.
- **If clonidine infusion is added alongside ketamine infusion 1:1 nursing or transfer to CICU is required**

2.6 Monitoring and observation of the child or young person as follows for PCA/NCA, Ketamine and clonidine infusion:

- Explain to the parent/carers and child/young person what observations are necessary and why
- Wherever possible care for the child/young person close to the nurses' station or monitored cubicle
- **Hourly** recordings of, pulse, respiration rate, oxygen saturation, sedation, emesis and pain level scores including the rate and amount of demands (total and good) for the **first four hours and two hourly thereafter if over 6 months (morphine only)**
- **Continue observations HOURLY for babies under 6 months** and for all **fentanyl, ketamine and clonidine infusions**
- Continuous oxygen saturation monitoring for the **duration of the infusion and for 2 hrs post infusion for Fentanyl, Ketamine & Clonidine**

N.B. Continuous oxygen saturation monitoring should be used for children and young people within the oncology department undergoing regular PCA/NCA unless it is clinically judged that the child/young person is NOT opiate naïve and therefore not at risk of respiratory depression (**Morphine only**)

- **Hallucinations (ketamine infusions)** – Suspended ketamine infusion and if pain recurs re-commence at a lower rate. Consider changing ketamine to clonidine.
- **Hypotension (Clonidine infusion)** – Suspended clonidine infusion and if pain recurs re-commence but at a lower rate. Consider giving fluid bolus if this is indicated – review by ward 27 oncology team. Consider changing clonidine infusion to ketamine.

NCA- monitor the effectiveness of an NCA bolus by checking the child/young persons' pain score 5-10 mins after administration - **A sleeping or sedated child should NEVER be given a bolus of IV opioid**

NB. In a few patients all 3 drugs i.e. an opioid, ketamine and clonidine are required to maintain effective pain relief – unless 1:1 nursing and continuous observation are available, transfer to CICU/HDU is strongly recommended to allow for constant observation and monitoring

See appendix 1 for troubleshooting guidance

If the child becomes terminally ill discuss with the palliative care team

2.7 Alert nurse coordinator/medical staff if:

- The child/young persons' respiratory rate falls below the rates on the patients E-obs or that which is normal for the patient and be prepared to administer Naloxone prescribed at 4 micrograms per KG* (initial dose) for partial reversal, and repeat after 1 minute if required, to cumulative total dose not greater than 2mg, irrespective of body weight. If inadequate effect or complete reversal required, use 100 micrograms per KG dose instead, repeated as

necessary, to cumulative total dose not greater than 2mg (see page 13)

- The child/young persons' oxygen saturation levels fall below 92%

Give supplementary oxygen at 15litres

Stop the infusion if oxygen levels do not improve or continue to fall below 92%

Be aware in cases of a child/young person experiencing sickle cell crisis or the child/young person with underlying respiratory/cardiac conditions the optimum oxygen saturation level must reflect the child's underlying condition

If any problems or concerns should arise **stop the pump and remove the handset from the child/young person** and contact the initiating doctor or the children's pain team. Out of hours contact the ward 27 oncology consultant on call*.

*** If this guidance is used outside ward 27 on a non-oncology patient anaesthetics will manage the patient and the on call team out of hours will be anaesthetic registrar on call**

2.8 Assessment

- Allow the child/young person to assess their own pain using the pain tool identified during the admission process. Use the FLACC/FACES scale for babies and non-verbal and younger children
- Assess sedation level using the Children's Hospital Sedation Level (AVPU) - if P or U **STOP** infusion and seek medical advice.
- Assess emesis level using the Childrens Hospital Nausea and Vomiting Scale: administer anti emetics if required (see adjuvant drugs on page 13)

2.9 Discontinuing the PCA/NCA/Ketamine/Clonidine infusion:

- See weaning protocol below (if required)
- Ensure regular analgesia has been administered
- Record and sign the amount of morphine/fentanyl/ketamine to be disposed of on the front sheet with **two** Registered nurses checking the amount
- Dispose of the morphine/fentanyl/ketamine in appropriate facility
- Continue observations 2hrly for 4 hours after discontinuing infusion.

Continue observations and pain scores at least 4 hourly to ensure regular analgesia is adequate

Weaning Clonidine, ketamine and Fentanyl Infusions

Suggested weaning plans:

- **Duration less than 7 days** - PCA/NCA can be stopped without weaning. Consider bolus-only for a short period i.e. 4-6 hours if any reluctance concerns
- **Duration more than 7 days** – see below

Wean in the following order:

Clonidine, Ketamine, Fentanyl (or Morphine)

Clonidine infusion:

Reduce by 0.2ml every 6 hours, if no deterioration in pain score, until infusion stopped

Ketamine infusion:

Reduce by 0.5ml every 6 hours, if no deterioration in pain score, until infusion stopped

Fentanyl PCA/NCA:

Reduce background rate by 0.5ml every 6 hours if no deterioration in pain score, until bolus only. Continue bolus-only for up to 24 hours prior to stopping.

If fentanyl PCA/NCA cannot be weaned to completion due to ongoing pain CONVERT to fentanyl patch (to replace background infusion) and oral morphine (to replace boluses). Refer to www.medicines.org.uk for conversions tables

1. **Apply the fentanyl patch** 12 hours prior to stopping fentanyl PCA/NCA background
2. **Continue bolus-only** for 24 hours prior to converting boluses to oral morphine
3. **Fentanyl patches may be withdrawn gradually** when no longer needed by reducing the patch size every 72 hours

Morphine PCA/NCA Reduce background rate by 0.5ml every 6 hours if no deterioration in pain score, until bolus only. Continue bolus-only for up to 24 hours prior to stopping.

If morphine PCA/NCA cannot be weaned to completion due to ongoing pain CONVERT to MST (to replace background infusion) and oral morphine (to replace boluses).

Adjuvant Drugs – the following drugs should be prescribed when PCA/NCA is commenced

| DRUG | ROUTE | DOSE | FREQUENCY | MAX DOSE |
|---|--|--|--|----------|
| Naloxone (This dose reverses adverse effects of opioids i.e. respiratory depression, sedation, NOT analgesic effect) | IV bolus | *4 microgram/kg | Repeat after 1 minute if required, to cumulative total dose not greater than 2mg | 2mg |
| Naloxone (For severe opioid itching) Unlicensed indication – second line | IV Bolus | 0.5microgram/kg | Repeat at 10 minute intervals | 4 doses |
| | IV infusion | 1 microgram/kg/hr | | |
| Ondansetron | Oral/IV bolus | See CYPICS anti-emetic policy for dosing | | |
| Chlorphenamine | Oral/IV | See BNFC for doses | | |
| Lactulose or Movicol/Laxido Paed | For prevention/treatment of constipation. See BNFC for doses | | | |
| Dexamethasone | Can be considered for anti-emetic following discussion with ward 27 oncology consultant and pharmacist | | | |

**The Childrens & theatres Q&S group have authorised the dose in this guideline which differ from those in the current BNFC*

3. Education and Training

All nursing staff caring for and setting up morphine & fentanyl PCA/NCA and ketamine & clonidine infusion must be IV competent and have attended and signed off competent for the PCA/NCA/Morphine Infusion section of the Paediatric Pain Management Study Day. This will ensure that staff:

- Can give an explanation to the child/young person and family on PCA/NCA, ketamine and clonidine infusion to achieve maximum benefit from its effects
- Can programme the pump
- Can check, programme and change the pump if the child/young persons' condition changes
- Able to troubleshoot the pump
- Able to troubleshoot any problems or complications associated with the PCA/NCA, ketamine and clonidine infusion
- Have an understanding of the side effects of morphine, ketamine and clonidine and are able to deal with complications effectively
- Have an understanding of which drugs can be given alongside PCA/NCA, ketamine and clonidine infusion

4. Monitoring Compliance

| What will be measured to monitor compliance | How will compliance be monitored | Monitoring Lead | Frequency | Reporting arrangements |
|--|---|------------------------|--|---------------------------------------|
| 100% of prescriptions are prescribed on eMeds | NerveCentre | Zoe Syrett | Pain nurse to liaise with relevant clinical area management if issues arise with prescribing | Datix – Clinical risk management team |

5. Supporting References

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- Royal College of Anaesthetists (2012) Good Practice in Post-Operative and Procedural Pain Management, 2nd Edition.
- Royal College of Nursing (2009) Recognition and Assessment of Acute Pain in Children, Update of full guideline, September
- Alder Hey Children's NHS Foundation Trust (2018) PCA/NCA – Opioid Infusions via the Intravenous or Subcutaneous Route, Guidelines for the management of Children

- Alder Hey Children's NHS Foundation Trust (2019)
Haematology/oncology patients guideline for management of pain using PCA/NCA
- Evelina London Paediatric Formulary:
<http://cms.ubqo.com/public/d2595446-ce3c-47ff-9dcc-63167d9f4b80>

6. Key Words

Morphine, Ketamine, Clonidine fentanyl, children PCA, NCA

The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs. As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

| Contact and review details | |
|---|--------------------------------------|
| Guideline Lead (Name and Title) Z Syrett – Children's Nurse Specialist G Javid – Pharmacist E Ross - Consultant Paediatric Oncologist | Executive Lead Chief Nurse |
| Details of Changes made during review: Title change only 30/04/2024 – clarified that this guidance applies to complex acute pain Minor amendments only 26/11/24 - Reference to paper drug charts removed as now on eMeds Lock out times aligned to normal PCA guidelines | |

Appendix 1: Troubleshooting Chart

CHILDREN'S HOSPITAL



TROUBLESHOOTING CHART

| Respiratory Depression | Respiratory Arrest | Sedation |
|---|--|--|
| Monitor PEWS and if outside normal parameters then inform medical team and ask for medical review. | Simultaneously: <ul style="list-style-type: none"> • STOP PCA/NCA • Call for help and arrest team • Commence life support • Administer oxygen and naloxone as required. | Monitor levels of consciousness using AVPU : |
| Administer Oxygen at 15L as required to maintain desired oxygen saturation. STOP infusion if Oxygen Saturations do not improve or continue to fall below 92%. | | If score V: <ul style="list-style-type: none"> • Seek advice from Nurse in Charge. • Ask for medical review and ensure medics are happy that conscious level is satisfactory. |
| Remain with the child and continue to monitor and record respiratory rate, effort and oxygen saturation until these return to within acceptable limits | | If score P: <ul style="list-style-type: none"> • Suspend PCA/NCA and manage symptoms e.g. give oxygen if oxygen saturations <92%. • Inform medical team • Stay with patient until sedation levels improve. • If recommencing PCA/NCA consider reducing background infusion rate – discuss with Ward 27 Consultant on Call. |
| If recommencing the PCA/NCA, consider reducing background infusion rate – discuss with Ward 27 Consultant on Call. Frequency of PEWS monitoring may need to be increased. | | If score U: <ul style="list-style-type: none"> • Suspend PCA/NCA and contact medical team immediately. • Manage symptoms e.g. administer oxygen • Stay with patient until sedation level improves • If sedation due to opioid and no other obvious reason administer Naloxone (Dose: 4 micrograms/kg. Max dose 200 micrograms) |
| Give Naloxone if no response to above interventions (Dose: 4 micrograms/kg. Max dose 200 micrograms) | | Continue to monitor PEWS regularly: frequency of monitoring may need to increase |

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Appendix 2: Problem Solving Table

CHILDREN'S HOSPITAL



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PROBLEM SOLVING - Morphine/ Fentanyl/ Ketamine/ Clonidine Infusion

| Twitching/ jerking | Pruritus | Nausea/ Vomiting | Urinary Retention | Constipation | Hallucinations (Ketamine) | Hypotension (Clonidine) |
|---|--|---|---|---|--|---|
| Consider reducing rate of morphine or changing to fentanyl | Prescribe and give antihistamine regularly | Monitor and record symptoms of Nausea and Vomiting | Consider suspending PCA/NCA until bladder empties | Prescribe laxatives on commencement of PCA | Suspend ketamine infusion and if pain recurs recommence but at a lower rate. | Suspend clonidine infusion and if pain recurs recommence but at a lower rate. |
| | Consider ondansetron | Prescribe regular antiemetics | If recommencing PCA/NCA, consider reducing background infusion rate. | Monitor bowel movements and record | Consider changing ketamine to clonidine | Consider giving fluid bolus if this is indicated – Discuss with consultants/ on-call consultants |
| | If on morphine and pruritus persists, consider changing to fentanyl OR If on fentanyl and pruritis persists, consider low dose naloxone infusion. | If using antiemetic with sedative effect such as Levomepromazine, frequency of monitoring may need to be increased/discussed with Ward 27 Consultant on Call. | Consider indwelling catheter if PCA/NCA likely to be needed for a few days or longer. | If possible, encourage mobilisation, using toilet rather than bed pan for example Encourage natural fruit juices, fluids, and high fibre diet. | | Consider changing clonidine infusion to ketamine. If clonidine is added alongside ketamine, 1:1 nursing or transfer to CICU is required |
| <p>N.B. if this infusion is being used for end of life care then interventions may be different to what is advised above, so always discuss agreed parameters with Ward 27 consultant on call and discuss if unsure of what interventions are appropriate.</p> <p>If this guidance is used outside Ward 27 on a non-oncology patient anaesthetics will manage the patient and the on call team out of hours will be anaesthetic registrar on call</p> | | | | | | |

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